

## Claims

We claim:

1. A process of synthesizing metal and metal nitride nanowires, comprising the steps of:

5 forming a catalytic metal on a substrate;

heating said catalytic metal on said substrate in a pressure chamber

adding gaseous nitrogen and/or hydrogen reactant and/or solid metal source;

10 applying sufficient microwave energy (or current in hot filament reactor) to activate said gaseous metal reactant and/or solid metal source; and

forming nanowires of a selected metal or metal nitride of a desired length.

15 2. The process of synthesizing metal and metal nitride nanowires of claim 1, wherein said catalytic metal comprises gallium or indium.

3. The process of synthesizing metal and metal nitride nanowires of claim 1, wherein said substrate comprises fused silica  
20 quartz, pyrolytic boron nitride, alumina, and sapphire.

4. The process of synthesizing metal and metal nitride nanowires of claim 1, wherein said metal of interest comprises gold, copper, tungsten, bismuth, and combinations thereof.

5. A process of synthesizing metal and metal nitride nanowires, comprising the steps of:

forming a gallium metal on a fused silica quartz substrate;  
heating said catalytic metal on said substrate in a pressure chamber

adding gaseous nitrogen and/or hydrogen reactant to a solid metal tungsten nitride and/or tungsten source;

applying sufficient microwave energy (or current in hot filament reactor) to activate said gaseous nitrogen and/or hydrogen reactant to said tungsten nitride and/or tungsten source; and

forming nanowires of tungsten or tungsten nitride of a desired length.

6. A process of synthesizing metal and metal nitride nanowires, comprising the steps of:

forming an indium metal on a fused silica quartz substrate;  
heating said catalytic metal on said substrate in a pressure chamber

adding gaseous nitrogen and/or hydrogen reactant to a solid metal tungsten nitride and/or tungsten source;

applying sufficient microwave energy (or current in hot filament reactor) to activate said gaseous nitrogen and/or hydrogen

reactant to said tungsten nitride and/or tungsten source; and  
forming nanowires of tungsten or tungsten nitride of a desired  
length.

7. A process of synthesizing metal and metal nitride  
5 nanowires, comprising the steps of:

forming a gallium layer of about 100 microns on a fused  
silica quartz substrate;

placing the combination in a pressure chamber;

reducing the pressure in the chamber to 50 Torr;

10 heating the substrate and gallium to 700-1000 degrees C;

heating the tungsten filament to 700-1000 degrees C;

adding nitrogen gas;

applying sufficient microwave power to sputter tungsten into  
gas phase and continuing the process until the nanowires is of the  
15 desired length.